ZEOLITE-CONTAINING TREATING FLUID

Cross-Reference to Related Applications

[0001] This application is a continuation-in-part of prior Application No. 10/315,415, filed December 10, 2002, the entire disclosure of which is incorporated herein by reference.

Background

[0002] The present embodiment relates generally to a treating fluid, particularly a spacer fluid for introduction into a subterranean zone penetrated by a wellbore.

[0003] A spacer fluid is a fluid used to displace one "performance" fluid in a wellbore before the introduction into the wellbore of another performance fluid. For example, while drilling oil and gas wells, one performance fluid, such as an oil-based or water-based drilling fluid, is circulated through the string of drill pipe, through the drill bit and upwardly to the earth surface through the annulus formed between the drill pipe and the surface of the wellbore. The drilling fluid cools the drill bit, lubricates the drill string and removes cuttings from the wellbore. During the drilling process, the drilling fluid dehydrates or loses filtrate to the formation so that the fluid remaining in the annulus gels or increases in viscosity and a layer of solids and gelled drilling fluid known as filter cake is deposited against the formation face.

[0004] When the desired drilling depth of the well is reached, another performance fluid, such as a slurry containing a cement composition, is pumped into the annular space between the walls of the wellbore and pipe string or casing. In this process, known as "primary cementing," the cement composition sets in the annulus, supporting and positioning the casing, and forming a substantially impermeable barrier, or cement sheath, which isolates the casing from subterranean zones. It is understood that the bond between the set cement composition and the wellbore is crucial to zonal isolation.

[0005] However, the increase in viscosity of the drilling fluid and deposit of filter cake are detrimental to obtaining effective drilling fluid displacement and removal from the walls of the

wellbore and a subsequent competent bond between casing, primary cement and the walls of the wellbore. Incomplete displacement of the drilling fluid often prevents the formation of an adequate bond between the cement, the casing or pipe and the wellbore.

[0006] In addition, when pumping various fluids into a wellbore, it is important to make sure that they do not adversely affect the properties of other fluids in the wellbore. It is understood that such fluids having adverse reactions with each other are referred to as being "incompatible."

[0007] Spacer fluids are often used in oil and gas wells to facilitate improved displacement efficiency when pumping new fluids into the wellbore. Spacer fluids are typically placed between one or more fluids contained within or to be pumped within the wellbore. Spacer fluids are also used to enhance solids removal during drilling operations, to enhance displacement efficiency and to physically separate chemically incompatible fluids. For instance, in primary cementing, the cement slurry is separated from the drilling fluid and partially dehydrated gelled drilling fluid is removed from the walls of the wellbore by a spacer fluid pumped between the drilling fluid and the cement slurry. Spacer fluids may also be placed between different drilling fluids during drilling fluid change outs or between a drilling fluid and a completion brine.

[0008] While the preferred embodiments described herein relate to spacer fluids and cement compositions, it is understood that any treating fluids such as drilling, completion and stimulation fluids including, but not limited to, drilling muds, well cleanup fluids, workover fluids, conformance fluids, gravel pack fluids, acidizing fluids, fracturing fluids and the like can be prepared using zeolite and a carrier fluid. Accordingly, improved methods of the present invention comprise the steps of preparing a wellbore treating fluid using a carrier fluid and zeolite, as previously described herein, and placing the fluid in a subterranean formation.

[0009] Therefore, treating fluids that have beneficial rheological properties and are compatible with a variety of fluids are desirable.

Description

[0010] Treating fluids, preferably spacer fluids and cement compositions, as well as drilling, completion and stimulation fluids including, but not limited to, drilling muds, well cleanup fluids, workover fluids, conformance fluids, gravel pack fluids, acidizing fluids, fracturing fluids and the like, for introduction into a subterranean zone penetrated by a wellbore according to the present embodiment comprise zeolite and a carrier fluid. Preferably, the wellbore treating fluids also include one or more of a viscosifier, an organic polymer, dispersants, surfactants and weighting

materials. Examples of wellbore treating fluids are taught in U.S. Pat. Nos. 4,444,668; 4,536,297; 5,716,910; 5,759,964; 5,990,052; 6,070,664; 6,213,213; 6,488,091 and 6,555,505, each of which is incorporated herein by reference.

[0011] A preferred fluid for use in the present embodiment includes cementing compositions as disclosed in U.S. Patent Application No. 10/315,415 filed December 10, 2002, the entire disclosure of which is hereby incorporated herein by reference.

[0012] Preferably, the wellbore treating fluid is prepared as a dry mix including the zeolite and optionally the viscosifier, organic polymer and dispersants. Prior to use as a wellbore treating fluid, varying ratios of dry mix, weighting material, carrier fluid and optionally surfactants are combined to yield the desired wellbore treating fluid density and viscosity.

[0013] Zeolites are porous alumino-silicate minerals that may be either a natural or manmade material. Manmade zeolites are based on the same type of structural cell as natural zeolites and are composed of aluminosilicate hydrates having the same basic formula as given below. It is understood that as used in this application, the term "zeolite" means and encompasses all natural and manmade forms of zeolites. All zeolites are composed of a three-dimensional framework of SiO_4 and AlO_4 in a tetrahedron, which creates a very high surface area. Cations and water molecules are entrained into the framework. Thus, all zeolites may be represented by the crystallographic unit cell formula:

$$M_{a/n}[(AlO_2)_a(SiO_2)_b] \cdot xH_2O$$

where M represents one or more cations such as Na, K, Mg, Ca, Sr, Li or Ba for natural zeolites and NH_4, CH_3NH_3, $(CH_3)_3NH$, $(CH_3)_4N$, Ga, Ge and P for manmade zeolites; n represents the cation valence; the ratio of b:a is in a range from greater than or equal to 1 and less than or equal to 5; and x represents the moles of water entrained into the zeolite framework.

[0014] Preferred zeolites for use in the wellbore treating fluid of the present embodiment include analcime (hydrated sodium aluminum silicate), bikitaite (lithium aluminum silicate), brewsterite (hydrated strontium barium calcium aluminum silicate), chabazite (hydrated calcium aluminum silicate), clinoptilolite (hydrated sodium aluminum silicate), faujasite (hydrated sodium potassium calcium magnesium aluminum silicate), harmotome (hydrated barium aluminum silicate), heulandite (hydrated sodium calcium aluminum silicate), laumontite (hydrated calcium aluminum silicate), mesolite (hydrated sodium calcium aluminum silicate), natrolite (hydrated sodium aluminum silicate), paulingite (hydrated potassium sodium calcium barium aluminum silicate), phillipsite (hydrated potassium sodium calcium aluminum silicate), scolecite (hydrated calcium aluminum silicate), stellerite (hydrated calcium aluminum silicate), stilbite (hydrated sodium calcium aluminum silicate) and thomsonite (hydrated sodium calcium aluminum silicate).

Most preferably, the zeolites for use in the spacer fluids of the present embodiment include chabazite and clinoptilolite.

[0015] In a preferred embodiment of the invention, the wellbore treating fluid dry mix includes from about 5 to 90% by weight of zeolites, and more preferably from about 60 to 70% by weight of zeolites.

[0016] As used herein the term "viscosifier" means any agent that increases the viscosity of a fluid, and preferably produces a low density wellbore treating fluid preferably a spacer fluid which is compatible with drilling fluids, cement slurries and completion fluids. Agents which are useful as viscosifiers include, but are not limited to, colloidal agents, such as clays, polymers, guar gum; emulsion forming agents; diatomaceous earth; and starches. Suitable clays include kaolinites, montmorillonite, bentonite, hydrous micas, attapulgite, sepiolite, and the like and also synthetic clays, such as laponite. The choice of a viscosifier depends upon the viscosity desired, chemical capability with the other fluids, and ease of filtration to remove solids from the low density wellbore treating fluid. Preferably, the viscosifier is easily flocculated and filterable out of the wellbore treating fluid.

[0017] Preferably, the viscosifier is a clay and is preferably selected from the group consisting of sepiolite and attapulgite. Most preferably, the clay is sepiolite.

[0018] In a preferred embodiment, the wellbore treating fluid dry mix includes from about 5 to 80% by weight of the viscosifier, and more preferably from about 20 to 30% by weight of the viscosifier.

[0019] The wellbore treating fluids of the present embodiment preferably include a polymeric material for use as a viscosifier or fluid loss control agent. Polymers which are suitable for use as a viscosifier or fluid loss control agent in accordance with the present embodiment include polymers which contain, in sufficient concentration and reactive position, one or more hydroxyl, cis-hydroxyl, carboxyl, sulfate, sulfonate, amino or amide functional groups. Particularly suitable polymers include polysaccharides and derivatives thereof which contain one or more of the following monosaccharide units: galactose, mannose, glucoside, glucose, xylose, arabinose, fructose, glucuronic acid or pyranosyl sulfate. Natural polymers containing the foregoing functional groups and units include guar gum and derivatives thereof, locust bean gum, tara, konjak, starch, cellulose, karaya gum, xanthan gum, tragacanth gum, arabic gum, ghatti gum, tamarind gum, carrageenan and derivatives thereof. Modified gums such as carboxyalkyl derivatives, like carboxymethyl guar, and hydroxyalkyl derivatives, like hydroxypropyl guar can also be used. Doubly derivatized gums such as carboxymethylhydroxypropyl guar (CMHPG) can also be used.

[0020] Synthetic polymers and copolymers which contain the above-mentioned functional groups and which can be utilized as a viscosifier or fluid loss control agent include, but are not limited to, polyacrylate, polymethacrylate, polyacrylamide, maleic anhydride, methylvinyl ether copolymers, polyvinyl alcohol and polyvinylpyrrolidone.

[0021] Modified celluloses and derivatives thereof, for example, cellulose ethers, esters and the like can also be used as the viscosifier or fluid loss control agent of the spacer fluids of the present embodiment. In general, any of the water-soluble cellulose ethers can be used. Those cellulose ethers include, among others, the various carboxyalkylcellulose ethers, such as carboxyethylcellulose and carboxymethylcellulose (CMC); mixed ethers such as carboxyalkylethers, e.g., carboxymethylhydroxyethylcellulose (CMHEC); hydroxyalkylcelluloses such as hydroxyethylcellulose (HEC) and hydroxypropylcellulose; alkylhydroxyalkylcelluloses such as methylhydroxypropylcellulose; alkylcelluloses such as methylcellulose, ethylcellulose and propylcellulose; alkylcarboxyalkylcelluloses such as ethylcarboxymethylcellulose; alkylalkylcelluloses such as methylethylcellulose; hydroxyalkylalkylcelluloses such as hydroxypropylmethylcellulose; and the like.

[0022] Preferred polymers include those selected from the group consisting of welan gum, xanthan gum, galactomannan gums, succinoglycan gums, scleroglucan gums, and cellulose and its derivatives, particularly hydroxyethylcellulose. In a preferred embodiment, the wellbore treating fluid dry mix includes from about 0 to 6% by weight of the polymers, and more preferably from about 1 to 3% by weight of the polymers.

[0023] The wellbore treating fluids of the present embodiment preferably include a dispersant. Preferred dispersants include those selected from the group consisting of sulfonated styrene maleic anhydride copolymer, sulfonated vinyltoluene maleic anhydride copolymer, sodium naphthalene sulfonate condensed with formaldehyde, sulfonated acetone condensed with formaldehyde, lignosulfonates and interpolymers of acrylic acid, allyloxybenzene sulfonate, allyl sulfonate and non-ionic monomers. In a preferred embodiment, the wellbore treating fluid dry mix includes from about 1 to 18% by weight of the dispersant, and more preferably from about 9 to 11% by weight of the dispersant.

[0024] Preferably, the carrier fluid is an aqueous fluid, such as water, hydrocarbon-based liquids, emulsion, acids, or mixtures thereof. The preferred carrier fluid depends upon the type of drilling fluid utilized in drilling the wellbore, cost, availability, temperature stability, viscosity, clarity, and the like. Based on cost and availability, water is preferred.

[0025] Preferably, the water incorporated in the wellbore treating fluids of the present embodiment, can be fresh water, unsaturated salt solution, including brines and seawater, and

saturated salt solution. Generally, any type of water can be used, provided that it does not contain an excess of compounds, well known to those skilled in the art, that adversely affect properties of hydration.

[0026] In a preferred embodiment of the invention, the carrier fluid is present in the wellbore treating fluid at a rate of from about 45 to 95% by volume of the prepared wellbore treating fluid, and more preferably from about 65 to 75% by volume of the prepared wellbore treating fluid.

[0027] The wellbore treating fluids of the present embodiment preferably include a weighting material. Preferred weighting materials include those selected from the group consisting of barium sulfate, also known as "barite", hematite, manganese tetraoxide, ilmenite and calcium carbonate. In a preferred embodiment of the invention, the weighting material is present in the spacer fluid at a rate of from about 4 to 85% by volume of the prepared wellbore treating fluid, and more preferably from about 15 to 75% by volume of the prepared wellbore treating fluid.

[0028] When the wellbore treating fluids of the present embodiment are intended for use in the presence of oil-based drilling fluids or synthetic-based drilling fluids, the wellbore treating fluids preferably include a surfactant.

[0029] According to this embodiment, preferred surfactants include nonylphenol ethoxylates, alcohol ethoxylates, sugar lipids, α-olefinsulfonates, alkylpolyglycosides, alcohol sulfates, salts of ethoxylated alcohol sulfates, alkyl amidopropyl dimethylamine oxides and alkene amidopropyl dimethylamine oxides such as those disclosed in U.S. Patent Nos. 5,851,960 and 6,063,738, the entire disclosures of which are hereby incorporated herein by reference. Especially preferred surfactants include nonylphenol ethoxylates, alcohol ethoxylates and sugar lipids.

[0030] A suitable surfactant which is commercially available from Halliburton Energy Services of Duncan, Oklahoma under the trade name "AQF-2™" is a sodium salt of α-olefinic sulfonic acid (AOS) which is a mixture of compounds of the formulas:

$$X[H(CH_2)_n—C{=}C—(CH_2)_mSO_3Na]$$

and

$$Y[H(CH_2)_p—COH—(CH_2)_qSO_3Na]$$

wherein:

n and m are individually integers in the range of from about 6 to about 16;

p and q are individually integers in the range of from about 7 to about 17; and

X and Y are fractions with the sum of X and Y being 1.

[0031] Another suitable surfactant which is commercially available from Halliburton Energy Services of Duncan, Okla., under the trade designation "CFA-S™" has the formula:

$$H(CH_2)_a(OC_2H_4)_3OSO_3Na$$

wherein:

a is an integer in the range of from about 6 to about 10.

[0032] Another suitable surfactant is comprised of an oxyalkylatedsulfonate, which is commercially available from Halliburton Energy Services, Duncan, Okla. under the trade designation "FDP-C485."

[0033] Still another suitable surfactant which is commercially available from Halliburton Energy Services under the trade designation "HOWCO-SUDS™" is an alcohol ether sulfate of the formula:

$$H(CH_2)_a(OC_2H_4)_bSO_3NH_4^+$$

wherein:

a is an integer in the range of from about 6 to about 10; and

b is an integer in the range of from about 3 to about 10.

[0034] Another suitable surfactant is comprised of alkylpolysaccharides and is commercially available from Seppic, Inc. of Fairfield, N.J. under the trade designation "SIMUSOL-10."

[0035] Another suitable surfactant is cocoamine betaine and is commercially available under the tradename "HC-2" from Halliburton Energy Services of Duncan, Okla.

[0036] Another suitable surfactant is an ethoxylated alcohol ether sulfate having the formula:

$$H(CH_2)_a(OC_2H_4)_bOSO_3NH^{4+}$$

wherein a is an integer in the range of from about 6 to about 10 and b is an integer in the range of from about 3 to about 10.

[0037] Still another suitable surfactant is an alkyl or alkene amidopropyl betaine surfactant having the formula:

$$R\text{—}CONHCH_2CH_2CH_2N^+(CH_3)_2CH_2CO_2^-$$

wherein R is a radical selected from the group of decyl, cocoyl, lauryl, cetyl and oleyl.

[0038] Still another suitable surfactant is an alkyl or alkene amidopropyl dimethyl amine oxide surfactant having the formula:

$$R\text{—}CONHCH_2CH_2CH_2N^+(CH_3)_2O^-$$

wherein R is a radical selected from the group of decyl, cocoyl, lauryl, cetyl and oleyl.

[0039] In a preferred embodiment of the invention, the surfactant is present in the wellbore treating fluid at a rate of from about 0 to 20% by volume of the prepared wellbore treating fluid, and more preferably from about 2 to 6% by volume of the prepared wellbore treating fluid.

[0040] Spacer fluids are characterized by favorable 300/3 ratios. A 300/3 ratio is defined as the 300 rpm shear stress divided by the 3 rpm shear stress measured on a Chandler or Fann Model 35 rotational viscometer using a B1 bob, an R1 sleeve and a No. 1 spring. An ideal spacer fluid would have a flat rheology, i.e., a 300/3 ratio approaching 1. Moreover, an ideal spacer fluid would exhibit the same resistance to flow across a broad range of shear rates and limit thermal thinning, particularly at low shear rates.

[0041] When the wellbore treating fluids of the present embodiment are utilized as spacer fluids, the spacer fluids achieve 300/3 ratios of 2 to 6. As a result, the compositions are well suited for drilling fluid displacement. As shown in the following examples, the spacer fluids of the present embodiment have a relatively flat rheology and are pseudo-plastic with a near constant shear stress profile.

[0042] In one embodiment, the zeolite-containing wellbore treating fluid may be prepared as a dry mix including some or all of the above-identified components, except for the carrier fluid.

[0043] In carrying out the methods of the present embodiment, a wellbore is treated by introducing into the wellbore a treating fluid comprising zeolite and a carrier fluid. Also, in carrying out the methods of the present embodiment, a first fluid is displaced with an incompatible second fluid in a wellbore utilizing a wellbore treating fluid of the present embodiment to separate the first fluid from the second fluid and to remove the first fluid from the wellbore. In primary cementing applications, the wellbore treating fluid may be utilized as a spacer fluid and is generally introduced into the casing or other pipe to be cemented between drilling fluid in the casing and a cement slurry. The cement slurry is pumped down the casing whereby the spacer fluid ahead of the cement slurry displaces drilling fluid from the interior of the casing and from the annulus between the exterior of the casing and the walls of the wellbore. The spacer fluid prevents the cement slurry from contacting the drilling fluid and thereby prevents severe viscosification or flocculation which can completely plug the casing or the annulus. As the spacer fluid is pumped through the annulus, it aggressively removes partially dehydrated/gelled drilling fluid and filter cake solids from the wellbore and maintains the removed materials in suspension whereby they are removed from the annulus.

[0044] The following examples are illustrative of the methods and compositions discussed above.

EXAMPLE 1

[0045] Eight spacer fluids ("Fluids") were prepared by combining the components as set forth in **TABLE 1** below. Specifically, the dry mix materials, namely the zeolite, fumed silica, silica flour or coarse silica, the sepiolite, hydrous magnesium silicate, diatomaceous earth, dispersants, Biozan, and HEC were combined in a one liter glass jar and mixed by hand. This dry mix was then added to the mixing water in a Waring blender at 4,000 RPM in less than 10 seconds. The weighting material (barium sulfate) was then added to the Waring blender at 4,000 RPM in less than 10 seconds. The blender speed was then increased to 12,000 RPM and allowed to mix for 35 seconds. The dry mix components of the spacer fluids were added at the indicated rate on the basis of percent by weight of the dry mix and the water and barium sulfate were added at the indicated rate on the basis of percent by volume of spacer fluid composition to achieve the indicated density.

[0046] Fluids 1-3 are zeolite-containing spacer fluids according to the present embodiment. Chabazite, which is commercially available from C2C Zeolite Corporation of Calgary, Canada was used as the zeolite for fluids 1-3. Sepiolite is commercially available from Baroid Corporation of Houston, Texas. Hydroxyethylcellulose "HEC" is commercially available from Dow/Union Carbide of Midland, Michigan. Welan gum, a high molecular weight biopolymer, is commercially available from the Kelco Oil Field Group of Houston, Texas, under the trademark "BIOZAN." The dispersant is commercially available from National Starch & Chemical Company of Newark, New Jersey under the trade name "Alcosperse 602 ND" and is a mixture of 6 parts sulfonated styrene maleic anhydride copolymer to 3.75 parts interpolymer of acrylic acid.

[0047] Fluids 4-6 are conventional fumed silica-containing spacer fluids. Fumed silica is commercially available from Elken of Baltimore, Maryland.

[0048] Fluid 7 is a conventional silica flour-containing spacer fluid. Silica flour is commercially available from Unimin Corporation of New Canaan, Connecticut. Hydrous magnesium silicate is commercially available from Baroid Corporation of Houston, Texas.

[0049] Fluid 8 is a conventional coarse silica-containing spacer fluid. Coarse Silica was obtained from Unimin Corporation of New Canaan, Connecticut. Diatomaceous Earth is a commodity material commercially available from many sources.

TABLE 1

Comp nents	Fluid 1	Fluid 2	Fluid 3	Fluid 4	Fluid 5	Fluid 6	Fluid 7	Fluid 8
Zeolite	66.0	66.0	66.0	- -	- -	- -	- -	- -
Fumed Silica	- -	- -	- -	66.0	66.0	66.0	- -	- -
Silica Flour	- -	- -	- -	- -	- -	- -	94.54	- -
Coarse Silica	- -	- -	- -	- -	- -	- -	- -	35.3
Sepiolite	22.25	22.25	22.25	22.25	22.25	22.25	- -	11.8
Hydrous Magnesium Silicate	- -	- -	- -	- -	- -	- -	3.4	2.0
Diatomaceous Earth	- -	- -	- -	- -	- -	- -	- -	41.1
HEC	0.5	0.5	0.5	0.5	0.5	0.5	- -	- -
BIOZAN®	1.5	1.5	1.5	1.5	1.5	1.5	- -	- -
Dispersant	9.75	9.75	9.75	9.75	9.75	9.75	1.3	9.8
*Barium Sulfate	4.75	16.18	27.71	4.75	16.18	27.71	18.19	26.85
*Water	90.8	80.0	69.3	90.8	80.0	69.3	60.7	68.6
Density lb/gal	10.0	13.0	16.0	10.0	13.0	16.0	16.0	16.0

*volume %

[0050] Fluids 1 and 4, 2 and 5, and 3 and 6-8 listed in **TABLE 1** were designed to have densities of 10.0 lb/gal, 13.0 lb/gal, and 16.0 lb/gal, respectively.

EXAMPLE 2

[0051] Using a Fann Model 35 viscometer, the viscosity (in centipoise) of the zeolite-containing spacer fluids (Fluids 1, 2, and 3) and fumed silica-containing spacer fluids (Fluids 4, 5, and 6) from **EXAMPLE 1** were measured at the indicated temperature, and the Fann Model 35 viscometer dial readings at the associated revolutions per minute listed in **TABLE 2**.

TABLE 2

Rheology Tests

Comp. Tested	Temp. °F.	Measurement at rpm indicated, cp. 600	300	200	100	60	30	6	3	Yield Point lb/100ft^2	300/3 Ratio
1	80	43	30	25	19	15	12	7	6	11.9	5
	130	35	26	21	16	13	11	7	5	10.5	5.2
	190	31	23	20	16	14	12	9	8	12.2	2.9
4	80	40	27	23	19	16	14	9	7	14.2	3.9
	130	32	24	21	18	15	12.5	9	8	13.4	3.0
	190	29	21	18	15	13	12	9	7.5	11.9	2.8
2	80	102	72	59	43	35	28	17	15	26.8	4.8
	130	77	55	46	36	30	25	16	14	24.9	3.9
	190	55	40	33	25	21	17	11	10	16.7	4.0
5	80	89	63	51	37	30	23	14	12	22.2	5.25
	130	63	46	38	29	24	19	12	11	19	4.2
	190	45	34	27	20	18	15	10	8	14.1	4.25
3	80	172	123	101	75	62	50	36	31	48.5	4.0
	130	127	92	77	58	49	41	28	26	40	3.5
	190	105	76	65	51	45	37	27	23	37.8	3.3
6	80	177	127	105	79	65	52	37	34	51.2	3.7
	130	114	82	69	53	46	39	28	25	38.4	3.3
	190	95	69	57	44	37	31	22	20	30.4	3.45

[0052] **TABLE 2** shows that the zeolite-containing spacer fluids (Fluids 1, 2, and 3) compare favorably with the fumed silica-containing spacer fluids (Fluids 4, 5, and 6), in that they have relatively high viscosities and relatively low 300/3 ratios. Also, the yield points of the zeolite-containing spacers are comparable to the yield points of the silica-containing spacers. The yield point is a design parameter that determines the ratio of dry mix components to weighting materials to water.

EXAMPLE 3

[0053] Using a W.R. Grace Roto-tester, the pack set of the zeolite-containing spacer fluids (Fluids 1, 2, and 3) and fumed silica-containing spacer fluids (Fluids 4, 5, and 6) from **EXAMPLE 1** were measured.

[0054] The Zeolite-containing spacer fluids (Fluids 1, 2, and 3) from **EXAMPLE 1** had a pack set index of 21/22.

[0055] Fumed silica-containing spacer fluids (Fluids 4, 5, and 6) from **EXAMPLE 1** had a pack set index of 29/33.

[0056] The lower pack set index numbers of the zeolite-containing spacer fluids indicate that the zeolite-containing material will flow more easily and will not pack as severely as the fumed silica-containing spacer fluids.

EXAMPLE 4

[0057] Using a 250 mL. graduated cylinder oriented in a vertical position, the percent settling of the zeolite-containing spacer fluids (Fluids 1, 2, and 3) and fumed silica-containing spacer fluids (Fluids 4, 5, and 6) from **EXAMPLE 1** were measured. The spacer fluids were prepared according to Section 5, API Recommended Practice 10B, 22nd Edition, December 1997. The results are shown in **TABLE 3** below in terms of mL of free fluid in 250 mL.

TABLE 3

Days	Fluid 1	Fluid 4	Fluid 2	Fluid 5	Fluid 3	Fluid 6
2	1.6	3.2	2.1	2.1	1.1	3.2
3	2.1	4.2	2.6	3.2	1.6	4.2
4	2.1	4.7	3.2	4.7	2.1	5.3
5	2.1	5.3	3.7	4.7	2.6	6.3

[0058] The lower amount of free fluid in the spacer fluids prepared with zeolite (Fluids 1, 2, and 3) indicate better solids suspension than the spacer fluids prepared with fumed silica (Fluids 4, 5, and 6).

EXAMPLE 5

[0059] Using a FANN 35 viscometer, the viscosity of one of the zeolite-containing spacer fluids (Fluid 3), one of the fumed silica-containing spacer fluids (Fluid 6), the silica flour-containing spacer fluid (Fluid 7), and the coarse silica-containing spacer fluid (Fluid 8), from **EXAMPLE 1** were measured at three temperatures, and the FANN dial reading at 300 rpm was divided by the FANN dial reading at 3 rpm to give the 300/3 ratios listed in **TABLE 4**.

TABLE 4

Rheology	Fluid 3	Fluid 6	Fluid 7	Fluid 8
300/3 ratio at 80°F	4.0	3.7	11.0	9.0
300/3 ratio at 135°F	3.5	3.3	7.8	5.8
300/3 ratio at 190°F	3.3	3.4	5.3	5.6

[0060] The consistent 300/3 ratios exhibited by the zeolite-containing spacer fluid over a wide temperature range indicates its superiority over standard silica-containing spacer fluids.

[0061] While the preferred embodiments described herein relate to spacer fluids and cement compositions, it is understood that any wellbore treating fluids such as drilling, completion and stimulation fluids including, but not limited to, drilling muds, well cleanup fluids, workover fluids, conformance fluids, gravel pack fluids, acidizing fluids, fracturing fluids and the like can be prepared using zeolite and a carrier fluid. Accordingly, improved methods of the present invention comprise the steps of preparing a wellbore treating fluid using a carrier fluid and zeolite, as previously described herein, and placing the fluid in a subterranean formation.

[0062] Preferred methods of treating a well comprise the steps of providing a wellbore treating fluid comprising a carrier fluid and zeolite, and placing the wellbore treating fluid in a subterranean formation. Additional steps can include drilling, completing and/or stimulating a subterranean formation using the wellbore treating fluid and producing a fluid, e.g., a hydrocarbon fluid such as oil or gas, from the subterranean formation.

[0063] Other embodiments of the current invention will be apparent to those skilled in the art from a consideration of this specification or practice of the invention disclosed herein. However, the foregoing specification is considered merely exemplary of the current invention with the true scope and spirit of the invention being indicated by the following claims.